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PALÆONTOLOGICAL NOTES.

Lysorophus tricarinatus.—In 1877 Cope described from the Permian bone bed of eastern Illinois, three small vertebræ which he referred to a new genus and species, *Lysorophus tricarinatus*. The specimens were later redescribed and figured by the author in the JOURNAL OF GEOLOGY, Vol. VIII, p. 714, Plate II, Figs. 12*a*, 12*b*, 12*c*. This genus has not previously been recognized from any other locality, but in looking over a portion of the University of Chicago collection of Permian vertebrates from the Texas region I find the genus represented by some very interesting specimens. In a very restricted locality I found (the author collected the specimens here described) several series of vertebræ with attached ribs, which were peculiar in that the animal was evidently closely coiled when fossilization took place. This is such a persistent feature that some trace of it is noticeable in even the shortest series of vertebræ. It is difficult to explain this feature; the late Dr. Baur, before the specimens were identified, suggested that they might be embryos, but this seems rather improbable from the persistence with which the vertebræ cling together, and the very perfect degree of ossification. Another peculiarity is that the ribs are almost always attached but are crushed down and to the rear and are closely folded upon the vertebræ. In Fig. 1, Plate I, is shown one of the series of vertebræ with attached ribs, the curvature is not shown as it lies in the plane, perpendicular to the paper, but it is very noticeable in the specimen.

In the type specimens only the centra were known, and the deep pits on the sides, with the sharp intervening keels were made the determining characters of the genus. In the specimens from Texas, the neural arches are still in position, but the line of suture is very distinct; in the few vertebræ which have lost the neural arch, the characteristic angulation of the articular face of the centrum for the base of the neural arch, and the deep pit

in the floor of the neural canal between the arches are very distinct. A further point of interest lies in the fact that the two sides of the neural arch are united at the top by suture only, this remains distinct through life, as it is clearly seen in the largest and best ossified specimens. The ribs have but one head, and there seems to be no articular face preserved, indeed, in many of the specimens it looks as if the rib had been ankylosed to the end of the transverse process and broken off when the ribs were bent down to their present position. In some of the vertebræ the end of the transverse process shows the articular face for the rib. The top of the neural arches was expanded so that it forms a broad, low arch which is longer than the centrum and overlies rather widely the anterior zygapophyses of the succeeding vertebræ, Fig. 2, Plate I, shows one of the larger vertebræ twice natural size.

MEASUREMENTS.

Height from bottom of centrum to top of neural arch,	-	-	-	7mm
Greatest length of centrum,	-	-	-	5
Greatest length of the upper portion of the neural arch,	-	-	-	7

With the specimens of the vertebral column of *Lysorophus* was found a fragment of a small skull consisting of the anterior portion of the snout as far back as the middle of the orbit, and the anterior portion of the attached lower jaw. There is no reason to connect this specimen with the others, except that it occurs in the same restricted locality, a few square yards, and that no other bones were found, even after a careful search. So far as the specimen goes, it corresponds almost exactly with the description and measurements of *Isodectes* (*Pariotichus*) *megalops* Cope. From the character of the deposits it seems very probable that the skull belongs with the other specimens, and that we may have the skull of *Lysorophus*, if so, however, the genus *Isodectes* must be removed from the *Pariotichidae* as the vertebral column of that family has nothing in common with that of *Lysorophus*. No trace of the limb bones were found, and this with the coiled and firmly articulated vertebral column with its strong ribs has a very snake-like character, and it seems probable that the animal was very long-bodied and slender.

Pelycosauria.—Among the specimens in the Chicago collection is a single sacral vertebra which presents some very interesting points. It is the anterior one of the sacral series, and to one side is attached the sacral ribs in the natural position. The rib is united by a close articulation to the centrum, and the distal face is much expanded and turned somewhat to the rear. The lower edge of the centrum is preserved, and shows that it had the same peculiar oblique form characteristic of the cervical and sacral series of the Texas *Pelycosauria*. But the main interest centers in the neural arch as shown in Figs. 3 and 4, Plate I.

The base of the neural arch is perforated on each side by a large foramen. Between the posterior zygapophyses a stout ridge extends up the middle of the spine, and there is a rudimentary articular process at the base of the ridge. The upper half of the posterior face of the centrum is broad and flattened, and evidently served to form a very strong articulation with the second sacral. This seems to indicate the beginning of a sacrum, or it may be pathological. Unfortunately the specimen was isolated when found, so that the relation to the succeeding vertebrae cannot be exactly determined.

The pelvic and thoracic girdles of the American *Pelycosauria* have as yet been almost unknown. Cope published a figure of the scapula and coracoid of *Dimetrodon* and the author published with Dr. Baur a figure of a second specimen of the same; both of these specimens were somewhat incomplete. In 1886 Cope published a figure of the interclavicle of a *Pelycosaurian*. A peculiarly perfect specimen in the Chicago collection makes it possible to restore the thoracic girdle with much certainty. There are preserved the clavicles of both sides, the interclavicle, the scapula with attached coracoid and epicoracoid bones of one side and less perfectly the same bones of the other side. One of the clavicles lies upon the outer, under, side of the anterior expanded end of the interclavicle and the other lies upon the scapula.

The interclavicle is somewhat broken and the outer edges of the expanded portion are broken away in places, but the main

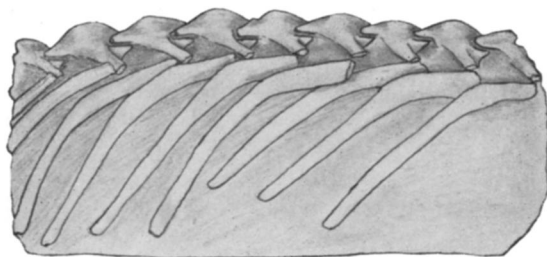


FIG. 1.

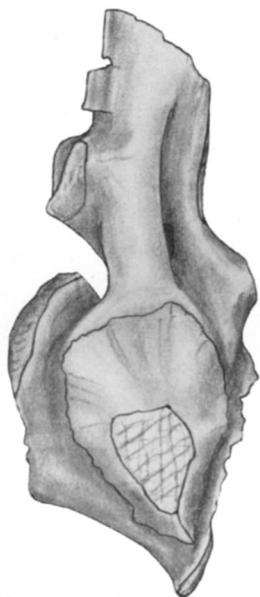


FIG. 3.



FIG. 2.

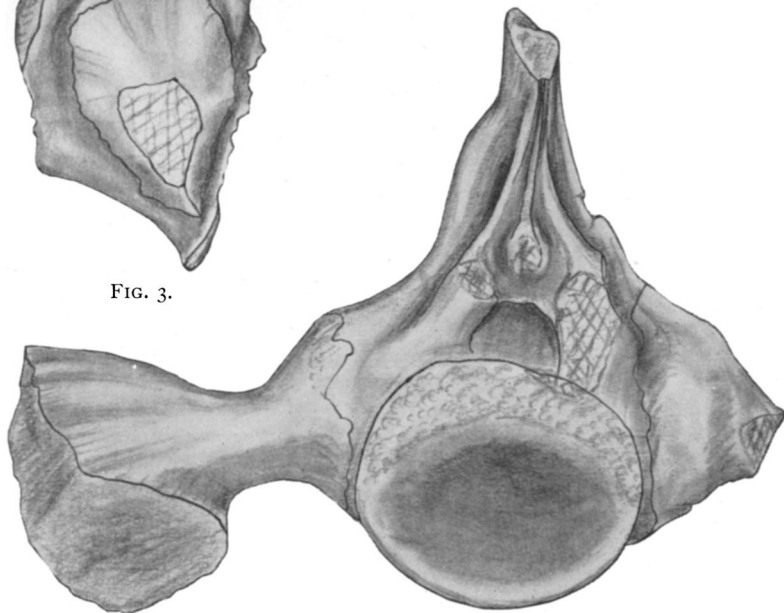


FIG. 4.

portion is preserved and it is evident that it does not differ materially from the form figured by Cope in 1886. The expanded end is very thin and the edges ended in digitate expansions. The posterior elongation is thicker in the middle, but thins out at the edges.

The clavicles are peculiar bones, widely expanded at the inner extremity where they overlap the interclavicle and with almost rectangular anterior inner corners. Toward the outer extremities they come almost to a point and in life overlay the middle portion of the scapula. The whole bone is slightly curved to conform to the girdle and is thin and plate-like at the inner portion and stouter and more rod-like distally. The prominence near the middle of the distal side is rugose and evidently served for ligamentous attachment.

The scapula and epicoracoid of one side are preserved almost complete and in the natural curvature; the coracoid is equally well preserved, but, as is common, separated from the others. (In the figure of the thoracic girdle the scapulæ appear slightly too long as in the representation on the flat the curvature does not appear.) The bones are quite similar to those figured in the papers cited, but the epicoracoidal edge is more rounded; the whole epicoracoid is very thin. The suture between the epicoracoid and scapula runs through the middle of the articular face for the humerus and then fades out into an almost complete ankylosis of the bones near the anterior edge. Fig. 6, Plate II, shows the scapula and epicoracoid without the coracoid in profile, giving a good idea of the curvature of the shoulder girdle.

The pelvis of the *Pelycosauria* has not previously been made out. Cope described what he considered to be the pelvis of *Dimetrodon*, but later discoveries showed it to be the pelvis of the amphibian *Eryops*. The same specimen which furnished the thoracic girdle described above affords an almost perfect pelvis. The bones are preserved in the same refractory iron-sand cement as the rest of the specimen and the slender edges of the bones have suffered accordingly, but the main portion of the bones

remain and enough of the edges to make the restoration here given fairly accurate. The three bones meet in the center of a wide and rather shallow cotyloid cavity with a very prominent inferior-posterior lip projecting from the ischial portion. The ilium is rather blunt anteriorly and tapers posteriorly, the inferior edge is thicker and rather rod-like and the upper portion is thinner and more plate-like. Attached by the iron cement to the inner side of the ilium are the distal ends of three sacral ribs, the anterior shows the same characters as figured in the solitary sacral vertebra described above. The anterior upper edge of the pelvis, formed by the adjacent portions of the ilium and pubis is rather rugose. The pubis is rather elongate, the upper edge is thicker and the lower thinner and plate-like. The ischium has a very thick acetabular portion which forms a prominent lip as described ; the rest of the bone is very thin and is rather rounded in outline. Closely cemented to the inner face of the ischium figured is the lower portion of the same bone of the opposite side. This ischium differs quite markedly from another in the same collection which is much more elongate and slender.

It is peculiarly unfortunate that a specimen which is so completely preserved should be preserved in a cement so hard that it is only by the sacrifice of the superficial layer of the bone that it can be removed. Any attempt to remove the cement is an almost hopeless task as it strikes sparks from the chisel; however, enough has been made out to show that it contains a nearly perfect half of the skull, the majority of the vertebral column, most of the limb bones, and a nearly perfect anterior foot, all of which the author hopes to describe and figure at an early date.

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EXPLANATION OF PLATES I AND II.

FIG. I.—Series of vertebræ from the middle portion of the column of *Lysorophus tricarinatus*. One-half natural size.

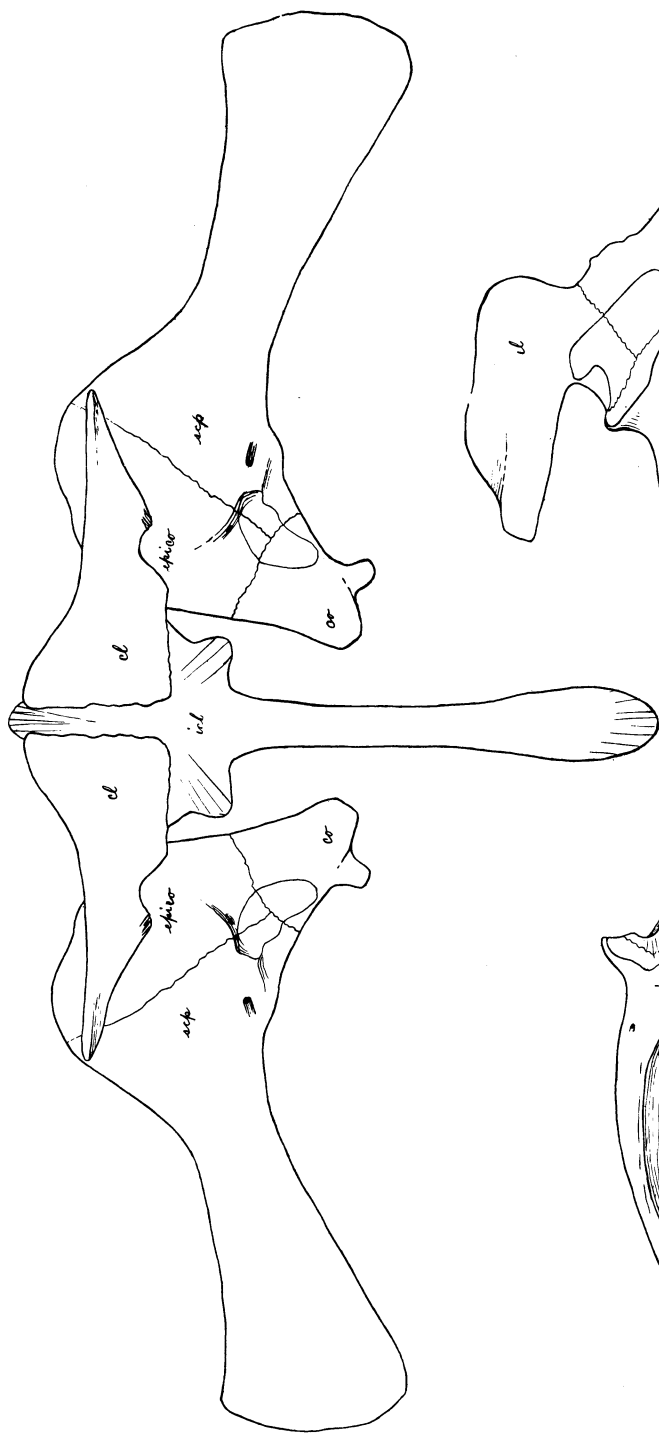


FIG. 5.

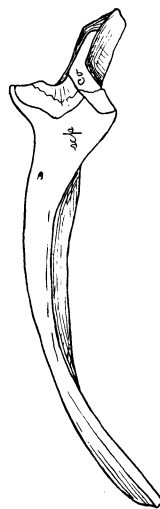


FIG. 6.

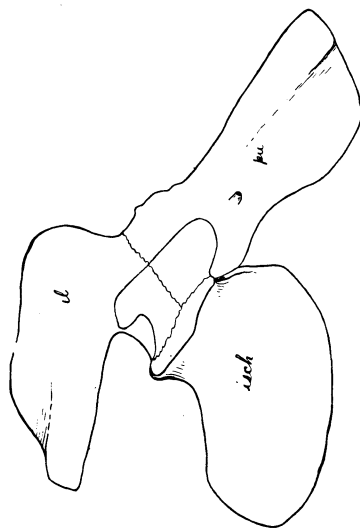


FIG. 7.

FIG. 2.—Vertebra from the middle portion of the column of *Lysorophus*. Twice natural size.

FIG. 3.—Lateral view of the first sacral vertebra of an undetermined Pelycosaurian. Natural size. The distal end of the sacral rib is detached.

FIG. 4.—Posterior view of the same vertebra with the distal end of the rib attached. Natural size.

FIG. 5.—Restoration of the shoulder girdle of a *Pelycosaurian*, *Embolophorous* (?). One-fourth natural size.

FIG. 6.—Profile view of the scapula and epicoroid shown in Fig. 5. The coracoid is not shown. One-fourth natural size.

FIG. 7.—Restoration of the pelvis of the same animal as shown in Fig. 5. One-fourth natural size.